

## Claims

We claim:

- 5 1. A method for detecting failures in an analyzer for conducting clinical assays comprising:
- a) identifying potential errors that can result in assay failures in an analyzer
  - b) identifying potential sources of the potential errors identified in a),
  - c) determining the probability that an error source so identified will result in a clinically significant error,
  - 10 d) identifying potential error detection measures corresponding to the source of potential errors,
  - c) selecting and implementing such error detection measures based on their probability of reducing errors to an acceptable limit along with a low probability of the false detection of an assay failure.
- 15 2. The method of claim 1 wherein the step of selecting error detection measures is done quantitatively.
- 20 3. The method of claim 1 conducted in an automated manner.
4. The method of claim 3 conducted by employing linear programming processes.
5. A method of detecting fluid metering failures comprising:
- 25 a) rapidly flushing a fluid delivery vessel with a fluid so that a foam is formed by the flushed liquid,
  - b) measuring the height of the foam within the vessel,
  - c) determining the volume of the dispensed liquid,
  - e) evaluating the sufficiency of the volume of the dispensed liquid, and
  - 30 f) identifying insufficient volumes as fluid metering failures.

6. The method of claim 5 wherein said measuring step is conducted by a liquid level sensor.

7. The method of claim 6 wherein said level sensor is a pressure sensing, capacitance, reflected energy, or visual detection sensor.

8. The method of claim 5 wherein the method of testing fluid is fast enough so that it can be done on every actuation without impacting system throughput or probe wash efficiency.

9. The method of claim 5 wherein the method is able to detect:

- a) partially plugged reagent probes,
- b) fully plugged reagent probes, and
- c) failed valves.

10. A method of detecting failures in assays that require sample dilution comprising:

- a) aspirating sample in a fluid delivery device,
- b) metering sample into a dilution vessel,
- c) metering diluent is metered into said dilution vessel,
- d) determining the volume of b) and c),
- e) determining the sufficiency of the measurement taken in d), and
- f) identifying as a failure insufficiencies identified in e).

11. The method of claim 10 further comprising the steps of

- g) metering reagent into the dilution vessel, and
- h) determining the volume of either i) the sample plus diluent plus reagent or, ii) sample plus diluent.

12. A carryover free fluid delivery and verification device comprising a hollow vessel through which fluid is dispensed having an end out of which fluid is dispensed, said vessel being in contact with a transducer, wherein said end out of which fluid is dispensed comprises a geometry resistant to carryover.

13. The device of claim 15 wherein said end out of which fluid is dispensed is notched.

14. A method of detecting analyzer failures comprising:

- I) a) rapidly flushing a fluid delivery vessel with a fluid so that a foam is formed by the  
flushed liquid,  
b) measuring the height of the foam within the vessel,  
c) determining the volume of the dispensed liquid,  
e) evaluating the sufficiency of the volume of the dispensed liquid,  
f) identifying insufficient volumes as fluid metering failures, and

- II) a) aspirating sample in a fluid delivery device,  
b) metering sample into a dilution vessel,  
c) metering diluent is metered into said dilution vessel,  
d) determining the volume of b) and c),  
e) determining the sufficiency of the measurement taken in d), and  
f) identifying as a failure insufficiencies identified in e).

15. A method of detecting analyzer failures comprising:

- I) a) rapidly flushing a fluid delivery vessel with a fluid so that a foam is formed by the  
flushed liquid,  
b) measuring the height of the foam within the vessel,  
c) determining the volume of the dispensed liquid,  
e) evaluating the sufficiency of the volume of the dispensed liquid,  
f) identifying insufficient volumes as fluid metering failures, and

- II) a) aspirating sample in a fluid delivery device,  
b) metering sample into a dilution vessel,  
c) metering diluent is metered into said dilution vessel,  
d) determining the volume of b) and c),  
e) determining the sufficiency of the measurement taken in d), and  
f) identifying as a failure insufficiencies identified in e), and

III) employing a carryover free fluid delivery and verification device comprising a hollow vessel through which fluid is dispensed having an end out of which fluid is dispensed, said vessel being in contact with a transducer, wherein said end out of which fluid is dispensed comprises a geometry resistant to carryover.

16. The method of claim 1 implemented by a computer program interfacing with a computer.

17. An article of manufacture comprising a computer usable medium having computer readable program code configured to conduct the process of claim 1.